

V. *Several Experiments on the Mercurial Phosphorus, made before the Royal Society, at Gresham-College, by Mr Fra. Hauksbee, F. R. S.*

Experiment I.

Shewing that Light is Produceable from Mercury, by Passing Common Air through the Body of it, after the Receiver is well Exhausted.

I Took a Glass Recipient open and ground at both ends, whose content was Equal to about 30 ounces of Water: The upper Orifice of which was clos'd with a Brass plate, by means of a wet Leather laid on the edge of it. In the middle of which Plate was screw'd a Stopcock, from whose lower Orifice was inserted by Cement a small Glass Tube, reaching from thence to near the Bottom of a Glass, included in the premention'd Receiver. In which Glass was put as much Quicksilver as would cover the Bottom of the Tube about a quarter of an Inch. Thus prepar'd, (see *Fig. the 1st*) and plac'd upon the Pump, the Stopcock was turn'd, to hinder the Airs passage that way, till the Receiver was sufficiently exhausted. Which being done, and the Stopcock return'd, the Air then rush'd strongly through the Body of the Mercury, (by Passing the Tube before mention'd) Blowing it up with Violence against the sides of the Glass that held it, appearing all round as a Body of Fire, made up of abundance of Glowing Globules, Descending again into its self. The *Phænomenon* continuing till the Receiver was half Repleat with Air.

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Experiment II.

Shewing that Mercury will Appear as a Shower of Fire, whilst descending in vacuo from the Top to the Bottom of a tall Receiver.

A Tall Receiver being provided about 21 Inches high, to whose upper Orifice was screw'd a Glass, resembling those now commonly us'd for Cupping, having an open Passage through the Neck of it; in which Passage was Cemented a piece of small Tube, drawn taper to one end by the flame of a Candle, which with the Cup then made an entire Funnel. The small Aperture of which was stop't with a round piece of a Stick as a Plug, to prevent the Mercuries entring the Receiver before its time. Within this tall Recipient was included a Glass about the height of 17 Inches, with a Round Crown like a Shade, (as they generally call such as are put o're Images to keep them from Dust.) In this manner (see *Fig. 2.*) being plac'd on the Pump, and about a pound and a half of Quicksilver put into the Funnel, (presuming now to call it so,) the Air was began to be withdrawn, and in two minutes of time was sufficient to exhibit the *Phænomenon*. For then Loosning the Plug that stop't the Funnel, the Mercury, by the Pressure of the Air, was driven violently into the Receiver, striking strongly on the Crown of the Included Glass, which broke the Quicksilver into small Particles, descending all around the Exposed sides of both the Glasses, appearing like a Shower of Fire in a very surprizing manner. The form of the Receiver, as well as the Included Glass, was very distinguishable by its light, and continu'd so till all the Mercury had entred thro the Funnel. What more occur'd to my Observation was, That the Descending Mercury did more resemble the falling of Snow, by the slowness of its motion, than that of Rain. That none of it appear'd luminous but what descended Contiguous to the sides of the Glasses. That the Globules of Mercury descended

scended some quicker than others, according to their Different Magnitudes. That the Descending Globules of Light (as by a strict Observation I have since made) did not slide down the sides of the Glasses, but were carried round by their own weight, as if they were turn'd on an *Axis*: Which is very well worth notice, That the Descending Globules had a Double Motion, the one Perpendicular, the other as a Rotation on an *Axis*. And in that motion the Adhering parts of Quicksilver were continually tearing from the sides of the Glasses, producing an Apt form, which in such a *medium*, from such a Body, exhibits Light. That the smaller Globules, whose weight were not sufficient to cause their Descent, remain'd opake, there being (in this as well as all other Mercurial Experiments) no Light to be obtain'd without Motion. That the same Motion given to the like Globules of Quicksilver in common Air, produce not the same Effect, as I have lately try'd, by forcing Mercury through Leather, by Condensing Air strongly on the surface of it. From all which it seems to appear very Plain, that there is Requir'd the Concurrence of a Proper Figure, *Medium*, and Motion, to Produce the Mercurial *Phosphore*.

Experiment III.

Shewing that it requires not so thin a Medium, as is made by the Weight of the Mercury in the Torricillian Experiment, to produce the Mercurial Phosphore.

TO try whether so thin a *Medium* as a *Vacuum*, or the Nearest Approach to it, was Absolutely necessary in the Production of such a Light as is Discoverable in the Barometer, by putting the Mercury in motion, I made use of the Gage belonging to my Air Pump, as (I thought) the most Proper Instrument for that Purpose. (Which Gage being so well known to this Society, I need not here trouble you with a Description of it.) Upon the Plate of the Pump I plac'd a small Receiver, the Air from which being
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withdrawn, the Quicksilver in the Gage was Elevated to 29 Inches and a half. Then suffering some Air to re-enter the Receiver by the Cock, the Mercury in the Gage descended, and made several Vibrations before it became stagnant: In all which it appear'd Luminous only whilst Descending, till the Quicksilver was Purposely Broke by a Violent Agitation of it. Then the Separate Parts appear'd Light on their under Surfaces, which became Concaves during their Ascending, as the other were when they exhibited their Light Descending: The Convex Surfaces being always opaque. These Appearances continu'd upon every admission of Air, till near half was admitted. But after that, tho the Mercury had the same Motion given it as before, yet no manner of Light did ensue. Hence it readily concludes, that notwithstanding the Mercurial *Phosphorus* in the *Torricillian* Experiment, is not producible in so dense a *Medium* as Common Air; so on the other hand, it requires a *Medium* not so Thin by much as the nearest approach to a *Vacuum* to Effect it.

Experiment IV.

Shewing that a Considerable Light may be Produc'd from Mercury in a Glass, by giving it Motion before the Receiver is quite Exhausted,

HAVING provided some Quicksilver, very fine, and free from the least Appearance of Soil on its Surface, the Glass which held it being likewise very Clean and Dry; which Glass, with the Contain'd Mercury was Included within a Receiver on the Plate of the Pump, (in-form of *Fig. the 3d.*) From which I presently began to withdraw the Air. But before it was quite Exhausted, (the Mercury in the Gage not exceeding 28 Inches, the Barometer at the same time standing at 29 Inches and a half) the Pump was shaken, by which means the Mercury in the Included Glass being put in Motion, exhibited such a Light, that
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not only the Receiver and Included Glass were distinguishable by it, but Hands and Fingers on the outside were so too. It is to be observ'd, that altho the Quicksilver would give a Light upon a small motion, yet would that Light be inanc'd by the encrease of that Motion. What farther occur'd was, That when a pretty brisk Agitation of the Mercury was given, it would resemble Waves of Light breaking on the sides of the Glass, scattering some Species of the same Appearance towards the upper part of it. That upon the Repetition of the Experiment three or four times, the *Phosphores* seem'd every time to be more Vivid than other, till at last, by often shaking the Quicksilver, its surface became something solid, rendring the Light less then, than it had before. That in this, as well as in all other Mercurial Experiments, the Light Exhibited is of a very pale Colour. That the first Appearance of this Light, is, when about half the Air contain'd in the Recipient is exhausted, which still encreases with the Rarefaction; And Confirms with all the rest, the Necessity of a Rarety'd Air to such a degree, to Produce the Mercurial *Phosphore*, concurring with that made by the Motion of the Quicksilver in the Weather-glass.

Experiment V.

Shewing very odd Flashes of Light, upon the Repetition of the Experiment, resembling a Shower of Fire.

THe Account already given of this Experiment, so far as occur'd at the first time of making, leaves me but little room to add more. However, altho but little, 'tis too deserving to pass it by in silence: The Appearance of it being not only very surprizing, but Distinguishably the Clearest and most Vivid Light in all the Mercurial *Phosphori*, Produc'd in Rarety'd Air. The Description of the Receiver, Included Glass, and Funnel, being before given, I shall directly proceed to my farther Observations on the Ex-

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periment. Upon the Repetition of which, the Mercury did not only appear as a Shower of Fire, but from the Crown of the Included Glass were darted frequently Flashes resembling Lightning, of a very pale Colour, very distinguishable from the rest of the Light produc'd. The Flashes seem'd then to be darted Horizontally, altho at other times I have observ'd them to incline upwards, and sometimes downwards, sometimes from divers parts, as well from the outward Receiver, as Included Glass. Sometimes they would be thrown in a figure so odd, that I have no Idea of any Comparifon. I have likewise observ'd them to proceed directly from the stream of Quickfilver, as it descended from the Funnel, before it reach'd the included Glass. They generally fly to the side of the outward Receiver, (unless their Origin begins there, as sometimes I have observ'd) where the Light breaks, and spreads in a very odd form. Something farther observable was, That the Crown of the Included Glass appeared sensibly more Luminous than any other part of it; which Light was Constant without Alteration, during the Descent of the Mercury through the Funnel, and that was at least two minutes of time. The Quantity of Mercury us'd for this Experiment was about 3 l.

Experiment VI.

Shewing that Abundance of Particles of Light are discoverable, by shaking Quickfilver in a Glass even in the Open Air.

THe Title of this Experiment, at first sight, would seem to Contradict the Accounts given of all the foregoing Experiments, relating to the Production of the Mercurial Phosphore: In some of which I assert that the Phosphore of Quickfilver is not produceable but in such a Medium; now there I would be understood, A Light of the same nature and quality of that discover'd in the Barometer, by putting the Mercury in Motion: Which Light is very different from

from what is made by shaking Mercury in the Open Air, as was very sensible at the making of this Experiment. For, having put into a clean Glass Globe, (whose Content was equal to about 30 ounces of Water) about half a pound of pure Quicksilver, then closing the mouth of it with a Brass Cap, in whose middle was inserted a Cock, by means of which a liberty was given for a free Communication with the Outward Air: Thus prepared, the Globe was shaken, and the Particles of Light appear'd plentifully, about the bigness of small Pins heads, very vivid, resembling bright twinkling Stars, exhibiting some small faint Light, like the whitish Appearance of the *Via Lactea*. Their Number increas'd according to the Rapidity of the Motion given. This being the whole product of the Experiment in the Open Air, I then took the same Glass, with the same Mercury, and apply'd it to the Pump, by means of a hollow Brass Pipe, which screw'd both to the Cock and Pump (in manner of *Fig. 4.*) The Air from within which being withdrawn, and the Cock turn'd, to prevent its getting in again, it was taken off, and moderately shaken; the Mercury then did appear Luminous all round, not as before, like little bright Sparks, but as a Continu'd Circle of Light during that motion: But when that Motion was check'd with another of greater Violence, it then appear'd Luminous almost all over the Globe. Upon suffering the Air to return, that mode of Light vanish'd, nor could any thing be Recover'd by shaking, but only the bright Sparks, as at first.

Fig: 1.

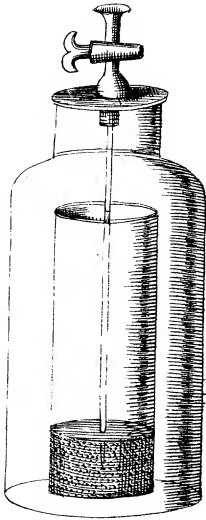


Fig: 2.

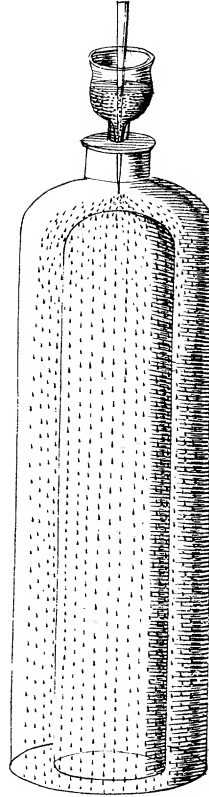


Fig: 3.

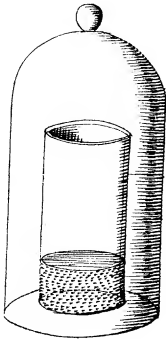


Fig: 4.

